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Relevant for us? We-prioritization in cognitive processing

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Abstract

1
2 Humans are social by nature. We ask whether this social nature operates as a lens through which
3 individuals process the world even in the absence of immediate interactions or explicit goals to
4 collaborate. Is information that is potentially relevant to a group one belongs to ('We') processed
5 with priority over information potentially relevant to a group one does not belong to ('They')?
6 We conducted three experiments using a modified version of Sui and colleagues' (2012) shape-
7 label matching task. Participants were assigned to groups either via a common preference
8 between assigned team-members (Experiment 1) or arbitrarily (Experiment 2). In a third
9 experiment, only personal pronouns were used. Overall, a processing benefit for we-related
10 information (we-prioritization) occurred regardless of the type of group induction. A final
11 experiment demonstrated that we-prioritization did not extend to other individual members of a
12 short-term transitory group. We suggest that the results reflect an intrinsic predisposition to
13 process information 'relevant for us' with priority, which might feed into optimizing
14 collaborative processes.

15 *Keywords:* self-prioritization, we-prioritization, group processing, we-mode, joint action

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Public Significance Statement

- This study demonstrates that humans rapidly and preferentially process group-relevant information even in the absence of an immediate goal to collaborate with a group.
- The ‘we’ effect obtained for the present ad hoc transitory groups is likely to be distinct from self-prioritization because familiar others who were integrated within the group did not similarly elicit prioritization effects as predicted by an ‘extended self’ hypothesis.
- We-prioritization might stem from top-down prioritization of information that is beneficial to the group.

1 **Relevant for us? We-prioritization in cognitive processing**

2 Humans live in a social world and have evolved to adapt and succeed within their
3 environments through highly collaborative means (Tomasello, 2014). Indeed, the strength of
4 human society seems to rest upon individuals working together. One intrinsic aspect of this
5 collaborative tendency is that humans may process information and act upon the world not only
6 from an individual point of view but as part of a group. Indeed, it may be that processing
7 information as an individual and as a social entity is qualitatively different (Gilbert, 1989).

8 It is clear that the self holds considerable weight in the human cognitive system from the
9 abundance of research demonstrating self-advantages on a range of stimuli (Own Face: Brédart,
10 Delchambre, & Laureys, 2006; Sui, Zhu, & Han, 2006; Virtual and real self-owned objects:
11 Constable, Welsh, Huffman, & Pratt, 2019; Truong, Roberts, & Todd, 2017; Arbitrary shapes:
12 Constable, Rajsic, Welsh, & Pratt, 2019; Sui, He, & Humphreys, 2012). It often seems that,
13 regardless of the social environment, humans must be permanently tuned to seek and respond to
14 self-related information. Indeed, self- stimuli prompt increased information uptake that results in
15 faster decision making (Golubickis et al., 2017) and recent theory has suggested a dedicated self-
16 network that is primed to process incoming self-stimuli (Humphreys & Sui, 2016).

17 However, the cognitive system also clearly assigns considerable weight to processes that
18 support human interaction. Here we ask whether the human collaborative predisposition acts as a
19 lens through which we process the world. To be precise, even in absence of an explicit intention
20 to collaborate, is information that is relevant for the collective opportunistically prioritized in
21 cognitive processing? Prioritization of information that is relevant for ‘us’ may serve to benefit
22 future joint actions (Sebanz, Bekkering, & Knoblich, 2006). In this way, the selection and
23 prioritization of group relevant information might be an important component of the ‘we-mode’

1 (Gallotti & Frith, 2013), enabling individuals to see what is relevant and what can be achieved
2 from the perspective of the group rather than from the perspective of the individual. It has been
3 proposed that the ‘we-mode’ is supported by a set of cognitive functions that support successful
4 interactions with others and the achievement of collaborative goals (Gallotti & Frith, 2013;
5 Tuomela, 2006). It allows individuals to process incoming information within the context of an
6 interaction and thus gain access to their interaction partner’s cognitive experience while
7 enhancing the potential for understanding (see Gallotti & Frith, 2013; Vesper & Sebanz, 2016 for
8 reviews). Although the we-mode is often described in terms of explicit mentalizing (Tuomela,
9 2006), implicit processes such as preferential processing of information relevant to one’s own
10 group may also contribute.

11 Previous research has discussed implicit processes implicated in the we-mode extensively
12 in relation to joint tasks and coordination. For example, it is thought that humans spontaneously
13 represent other’s tasks much as they would their own (Elekes, Bródy, Halász, & Király, 2016;
14 Sebanz, Knoblich, & Prinz, 2003; Welsh & McDougall, 2012) and in certain situations may
15 covertly simulate the perceptual (Constable, Pratt, Gozli, & Welsh, 2015) and/or bodily states of
16 another person (Brass, Bekkering, Wohlschläger, & Prinz, 2000). Although initiation of such
17 processes is dependent on specific task demands (Constable et al., 2017, 2015; Constable, Pratt,
18 & Welsh, 2018; van der Wel & Fu, 2015), dyads might co-represent each other’s tasks even to
19 the detriment of individual performance (Sebanz et al., 2003; Welsh et al., 2005).

20 There seems to be a dissociation in goal representations when the self is contextualized as
21 an individual or as a social entity. That is, when two or more people try to achieve a joint goal
22 they spontaneously represent the task as joint rather than simply representing the self and the
23 other task’s in tandem (e.g. Loehr, Sebanz, & Knoblich, 2013; Sacheli, Arcangeli, & Paulesu,

1 2018). Following on from the established literature concerning the prioritization of collective
2 goals in joint action, we predict that individuals should display a general tendency to prioritize
3 information associated with groups of which they are members relative to information associated
4 with groups they do not belong to. ‘We-prioritization’ should occur even when individuals are
5 not directly engaged in an interaction and when there is no explicit group goal. We also predict
6 that we-prioritization should manifest without the ‘glue’ that holds real-world teams together.
7 We predict this because prioritizing information that is ‘relevant for us’ should reflect a general
8 and established group orientation within the human cognitive system that helps humans act
9 effectively in their social environments and discover collaborative opportunities.

10 We also note that such predictions concerning we-prioritization could be made on the
11 basis of extant self-models (Humphreys & Sui, 2016; Symons & Johnson, 1997) if one views the
12 group as a collective self that extends from the individual self. Indeed, the theory of the
13 ‘extended self’ (Belk, 1998) has previously been applied to account for the prioritization effects
14 that are sometimes observed for participants’ mothers and best friends because these individuals
15 are supposedly close to the self (Schäfer, Wentura, & Frings, 2017). Concerning real world
16 teams, football fans show prioritization for the badge of their favorite football team as compared
17 to badges from a rival or neutral team (Moradi, Sui, Hewstone, & Humphreys, 2015) and rowers
18 show prioritization for their own rowing team (Enock, Sui, Hewstone, & Humphreys, 2018).
19 Interpreted within the context of the Self-Attention Network (Humphreys & Sui, 2016), one’s
20 own team would be prioritized within perceptual and attentional networks because the team can
21 be characterized as an extension of the self to the collective (Schäfer et al., 2017).

22 An alternative self-framework based on memory (Symons & Johnson, 1997) also predicts
23 a self-based effect for one’s own team, but for different reasons. In this framework, the team

1 would be integrated within a rich self-semantic network (Bower & Gilligan, 1979; Symons &
2 Johnson, 1997) by virtue of its connection to the self. This embeddedness within the self-
3 semantic network allows for more efficient access to and retrieval of information related to the
4 self because the ‘self’ acts as an entry point to memory structures that connect to a vast array of
5 information that might be activated and used for verification purposes (Constable, Rajsic, et al.,
6 2019; Klein & Kihlstrom, 1986; Klein & Loftus, 1988). We-prioritization under this framework
7 would be a byproduct of the group connection to the self.

8 **The present study**

9 To investigate if ‘we-prioritization’ is evident in cognitive processing we adapted a
10 shape-label matching task (Sui et al., 2012) that has been shown to be sensitive to self-
11 prioritization. This task demonstrates that information arbitrarily associated with self (e.g., a
12 particular shape) enjoys immediate processing benefits relative to other-associated stimuli (for an
13 overview see Humphreys & Sui, 2016). We used the Sui et al. (2012) procedure to establish
14 whether information arbitrarily associated to one’s own group enjoys similar immediate
15 processing benefits. In a short induction, participants associated arbitrary shapes with 1) a
16 collective including self (we), 2) a collective not including self (they), 3) self (me), and 4) a
17 stranger (he/she). The individual conditions were included to check whether the usual effects of
18 self-prioritization were present for our materials. Our primary prediction was that participants
19 should respond faster for we-matches than for they-matches. We tested this hypothesis across
20 different kinds of group induction. We started with groups that were formed on the basis of
21 shared preferences (Experiment 1). We then tested whether these shared preferences were
22 important by evaluating whether we-prioritization could also be elicited through arbitrarily
23 defined groups (Experiment 2). Experiment 3 did not employ a group induction and tested

1 whether the mere use of the pronoun ‘we’ would be sufficient for we-prioritization. If we-
2 prioritization reflects a general processing benefit for information that is relevant for us it should
3 occur across all three experiments, independently of whether group membership is established
4 through shared preferences, knowledge of individual group members, or use of pronouns.

5 Experiment 4 contrasted predictions based on we-mode literature (where “we” is distinct)
6 and the ‘extension of self’ literature where “we” includes the self). Pairs of participants were
7 recruited to perform a task together as a ‘team’ which existed solely for the purpose of the
8 experiment and disbanded upon completion of the experiment. A short induction required
9 participants to make associations between arbitrary shapes and themselves (self and assigned
10 team-member/co-actor), a stranger, their team, and another team. The pairs were then asked to
11 perform the shape/label matching task adapted to a joint task: one participant responded on
12 match trials and the other responded on mismatch trials. If we-prioritization is a mere extension
13 of self-prioritization then participants should also prioritize their co-actor’s stimulus because
14 their co-actor’s stimulus should also be integrated into the ‘self-network’ more than a stranger’s
15 stimulus (similarly to a mother's or a best friend's stimulus, see Schäfer et al., 2017).
16 Alternatively, if we-prioritization stems from a general collaborative orientation (Gallotti &
17 Frith, 2013; Tomasello, 2014) then only information that is relevant to the self and the group
18 should be prioritized. This go- no go task was also chosen to demonstrate how we-prioritization
19 might generalize to a situation more akin to real-world transitory group formation whereby
20 members of a group come together to perform a task using complimentary actions.

21 **Experiment 1**

22 To induce a feeling of group membership, a preference based group induction (Tajfel,
23 1970) was used whereby participants indicated a painting they preferred and were then matched

1 with another individual who allegedly preferred the same painting. The induction procedure also
2 presented the participants with other individuals who allegedly preferred different paintings. This
3 well-established manipulation generates a social identity in a deductive manner on the basis of
4 commonality between group members (Postmes, Spears, Lee, & Novak, 2005) and produces
5 robust in-group vs. out-group effects (Pinter & Greenwald, 2011). Thus, we used this induction
6 as a means to signal who the group members were. Nevertheless, we note that it was not our
7 intention to evaluate group identity in the traditional sense in relation to prioritization effects (see
8 Enock et al., 2018) but rather to evaluate the potential for we-prioritization in minimally
9 indicated transitory groups that have been established for the sole purpose of a given task.

10 After the group induction participants were asked to associate four labels with arbitrary
11 shapes: one shape representing their group ‘We’, one shape representing another group ‘They’,
12 one shape representing the participant ‘Me/I’, and one shape representing another participant
13 ‘He/She’¹. Participants then completed the shape-label matching task. We predicted faster
14 reaction times for we-matches than for they-matches, and faster reaction times for me-matches
15 than for he/she-matches.

16 **Method**

17 **Participants.**

18 The participants were 28 native Hungarian speakers aged 19 to 37 ($M = 24.82$, $SD = 4.75$,
19 12 male). They participated in the experiment in exchange for 1500 Hungarian Forints (HUF)
20 worth of supermarket vouchers. All participants had normal or corrected to normal vision. Based
21 upon the critical comparison of interest (reaction times toward self vs stranger stimuli), 28

¹ Note that our participants were Hungarian. In Hungarian the same gender-neutral pronoun ‘ő’ is used for ‘she’ as well as ‘he’, similar to singular they.

1 participants will provide an implied power of 96% for the large effect sizes ($d_z = .8$) reported in
2 previous studies.

3 **Stimuli and Apparatus.** Eight photographs (4 male, 4 female) of young adults were
4 taken from the FEI Face Database (Thomaz & Giraldi, 2010) to serve as potential group
5 members. Each person within the picture was centered and had a neutral expression. Eight four-
6 letter common Hungarian names (4 male: Máté, Imre, Márk, Ákos, 4 female: Anna, Sára, Réka,
7 Dóra) were selected to match the photographs. Three artworks by similar artists (Klee,
8 Kandinsky and Marc) were used for the group induction. Stimuli were presented through a
9 computer running Windows 10 on a computer screen with a spatial resolution of 1920X1080 and
10 refresh rate of 60 Hz. All text was presented in Hungarian.

11 **Procedure.**

12 Prior to testing, the experimenter took a picture of the participant and cropped the picture
13 in the same manner as the pictures of the photographs of people that would serve as potential
14 group members. This picture was then inserted into the experimental program. The whole
15 experiment was presented in Hungarian and any English instructions below have been translated
16 from the original experiment.

17 **Group Induction.**

18 To start, participants were given the following instructions on screen: *'Past studies have*
19 *shown that people have distinct preferences when it comes to artistic works. It has been shown*
20 *that preferences reveal something fundamental about the psychological characteristics and*
21 *personality of the person. In this experiment, you will first indicate your preferences between*
22 *three paintings by different artists.'* Participants were then asked to indicate which of the three
23 paintings they liked best from an array by pressing the A, B or C key. The location of the

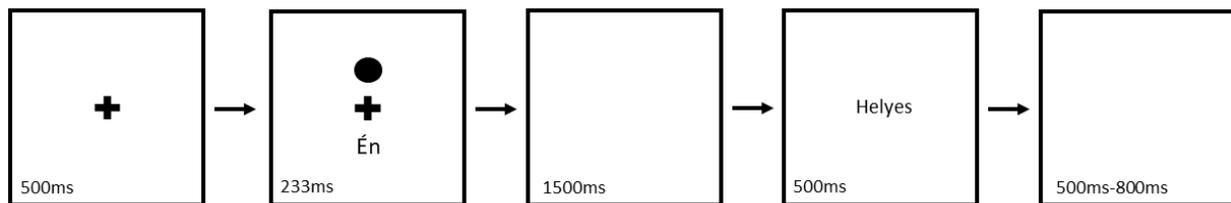
1 paintings was randomized for each participant. A screen then appeared with the participant's
2 photo and the painting they chose: *'You indicated that you prefer painting X.'* A picture of
3 another 'participant' (randomized) who supposedly chose the same painting then appeared
4 alongside the chosen painting and the participant's picture: *'X indicated that they preferred X*
5 *painting as well. Because you and X picked the same painting and X is similar to you, you will be*
6 *in a group together.'* A second group without the participant was then presented: *'X and X*
7 *indicated that they preferred painting X. Because they picked the same painting and they are*
8 *similar they will be in a group together.'* Last, a single individual was presented: *'X preferred*
9 *painting X. Because they were the only one to pick painting X they will be in a group by*
10 *themselves.'* Participants always viewed pictures of the same gender. Group assignment and the
11 names of 'other participants' were all randomized.

12 ***Shape Assignment and Training.***

13 For each participant, the pronouns were each randomly assigned a shape. Onscreen, the
14 shape and group pairing was presented for 30 seconds. For example, *'YOU are represented by*
15 *the CIRCLE, YOUR GROUP is represented by the DIAMOND, THE OTHER GROUP is*
16 *represented by the TRIANGLE, THE PERSON NOT IN A GROUP is represented by the STAR.'*
17 Each shape and label pairing were then presented alone for 10 seconds. For example: *Me =*
18 *Diamond, We = Star, They = Circle, He/she = Triangle.* Participants then completed 60 (15 for
19 each shape) training trials indicating who a shape represented, by pressing the q,w,o, or p keys
20 (response mappings randomized). The shape in the training trials was presented as a word rather
21 than the actual shape to ensure participants made an association with the concept but had no prior
22 training with the images of the shapes prior to the experimental phase.

1 **Matching Task.**

2 In the matching task participants indicated whether the label did or did not match the
 3 shape by pressing the ‘n’ or ‘m’ key (counterbalanced). We estimated visual angle (VA) on the
 4 basis of the average viewing distance of 57cm. A trial began with a white fixation cross (1.4° X
 5 1.4° VA) on a black background presented for 500 ms. A white shape (3.5° X 3.5° VA) and a
 6 white label (height: 1.4° VA) then appeared above and below the fixation cross for 233ms after
 7 which the screen went blank. The center of the fixation cross was 5.0° VA away from the center
 8 of each stimulus (Shape and Label). Participants were required to respond within 1500ms after
 9 the stimulus disappeared. Participants were provided with a longer time window to make a
 10 response than in the original task because pilot testing revealed that too many of our participants
 11 were unable to do the task with the original timings (Sui et al., 2012). Response feedback was
 12 given for 500ms in the form of Correct (‘*Helyes*’ presented in white text), Incorrect (‘*Téves*’
 13 presented in red text), or Too slow (‘*Túl lassú*’ presented in yellow text). There was a variable
 14 inter-trial interval of 500-800 ms. Participants completed 20 practice trials followed by 3 blocks
 15 of 96 trials. Location, shape, and label were fully counterbalanced and randomized within a
 16 block. See Figure 1 for the time course of a trial.



17
 18 *Figure 1.* Time course of a trial (not to scale).

19 **Design**

20 A 2 X 2 within-subjects design with ‘Reference’ and ‘Entity’ as factors (see Table 1) was
 21 used. The pronouns used in Hungarian are in brackets.

1 Table 1

2 *Experimental Design*

	<i>Entity</i>	
	Individual	Group
<i>Reference</i>		
Self	Me (Én)	We (Mi)
Other	He/She (Ó)	They (Ók)

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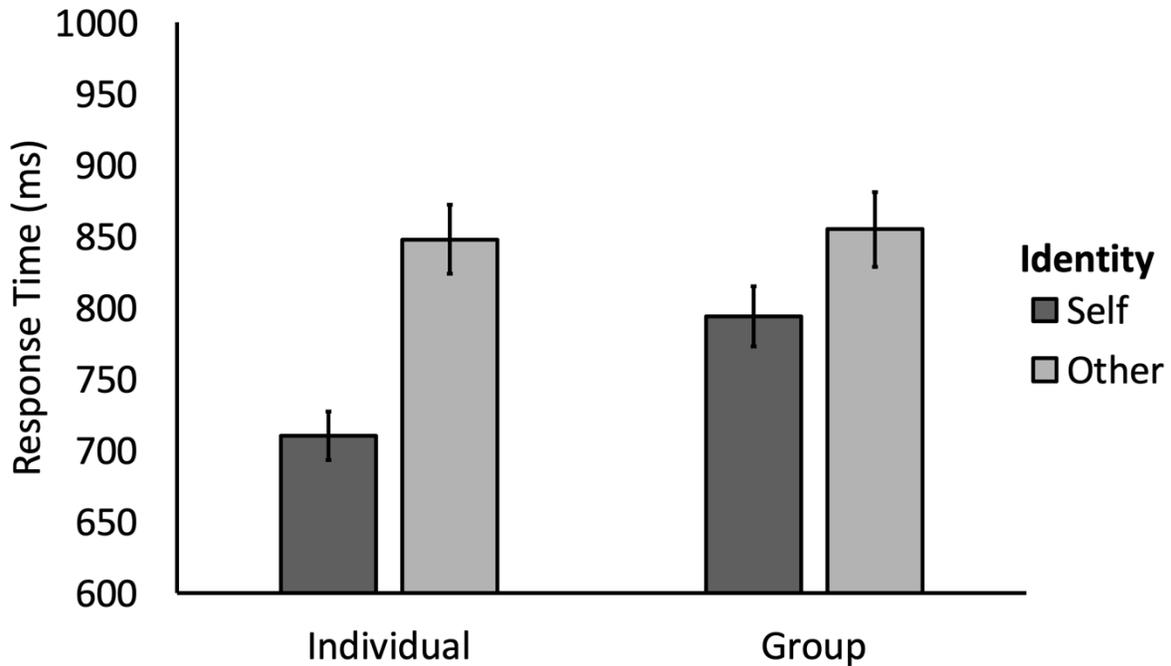
Results

10 Participants were generally accurate, $M = 91.37\%$, $SD = 4.91\%$, with participants
 11 performing more accurately on self-trials (Me and We) than other-trials (He/She and They).
 12 Because participants performed at ceiling in many cells, measures such as accuracy and d' are
 13 not likely to represent self-prioritization appropriately in the present experiment. For this reason,
 14 our primary dependent measure is Response Time (RT). Matching trials and Mismatching trials
 15 were analyzed separately because they are thought to involve different processes (Humphreys &
 16 Sui, 2016) and because Mismatch trials contain the important additional factor of Label Type.
 17 Trials 3 SD above or below the participant's mean and trials on which no response was made
 18 (1.12%) were removed prior to analysis. Effect sizes were calculated using the average standard
 19 deviation of both repeated measures in question (d_{av} ; Lakens, 2013). Following our primary
 20 analysis of RT we provide exploratory analyses concerning sensitivity (d') and decision criteria
 21 (c). We computed d' and c using the 'psycho' package in R (Makowski, 2018). As mentioned,
 22 many participants performed at ceiling levels. Because participants displayed very high hit rates
 23 and low false alarm rates we corrected for extreme values using a log-linear approach (Hautus,
 24 1995). Nevertheless, we would like readers to keep in mind these estimates are still likely to be

1 biased. All data for all experiments and the data submitted to inferential statistics in JASP (JASP
2 Team, 2018) can be found on the OSF: <https://osf.io/sejw7/>

3 *Match Trials*

4 A 2 X 2 repeated measures ANOVA with the factors ‘Reference’ (self-referential vs.
5 other-referential) and ‘Entity’ (individual vs. group) was conducted on matching trials. A main
6 effect of Reference was observed, $F(1, 27) = 43.18, p < .001, \eta^2 = .62$: Participants responded
7 faster on self-referential (750ms) than on other-referential trials (849ms). A main effect of Entity
8 also emerged, $F(1,27) = 8.47, p = .007, \eta^2 = .24$, with faster performance on individual trials
9 (774ms) compared to group trials (822ms). These effects were qualified by an interaction,
10 $F(1,27) = 9.50, p = .005, \eta_p^2 = .26$ which reflected a larger self-advantage in the individual trials
11 (138ms) compared to the group trials (61ms), $t(27) = 3.08, p = .005, d_{av} = .74, 95\% CI[0.03,$
12 $0.13]$. Because our research question centers on whether ‘We’ may be prioritized over ‘They’ we
13 performed a t-test comparing ‘We’ and ‘They’ trials only, to confirm the presence of we-
14 prioritization, $t(27) = 3.25, p = .003, d_{av} = .48, 95\% CI[0.02, 0.10]$. Together the results of
15 Experiment 1 show that we-prioritization was present but did not manifest to the same extent as
16 self-prioritization.



1

2 *Figure 2.* Reaction Times for Match trials by Reference (Self/Other) and Entity

3 (Individual/Group). Error bars represent Standard Error.

4 ***Mismatch Trials***

5 For mismatch trials, the factor of Label (Self/Other) was added to the analysis. Labels

6 were coded in terms of identity relation (Self: Me & We, Other: He/She, They). Thus, a

7 2(Reference: Self-Referential/Other-Referential) X 2(Entity: Individual/Group) X 2(Label:

8 Self/Other) repeated measures ANOVA was performed on the data for Mismatch Trials. The

9 only significant main effect observed was that of Label, $F(1,27) = 23.29, p < .001, \eta^2 = .46$, with

10 participants responding faster on trials with a self-label (Me or We) than trials with an other-

11 label(He/She, or They), 850ms and 884ms respectively. Main effects associated with Reference

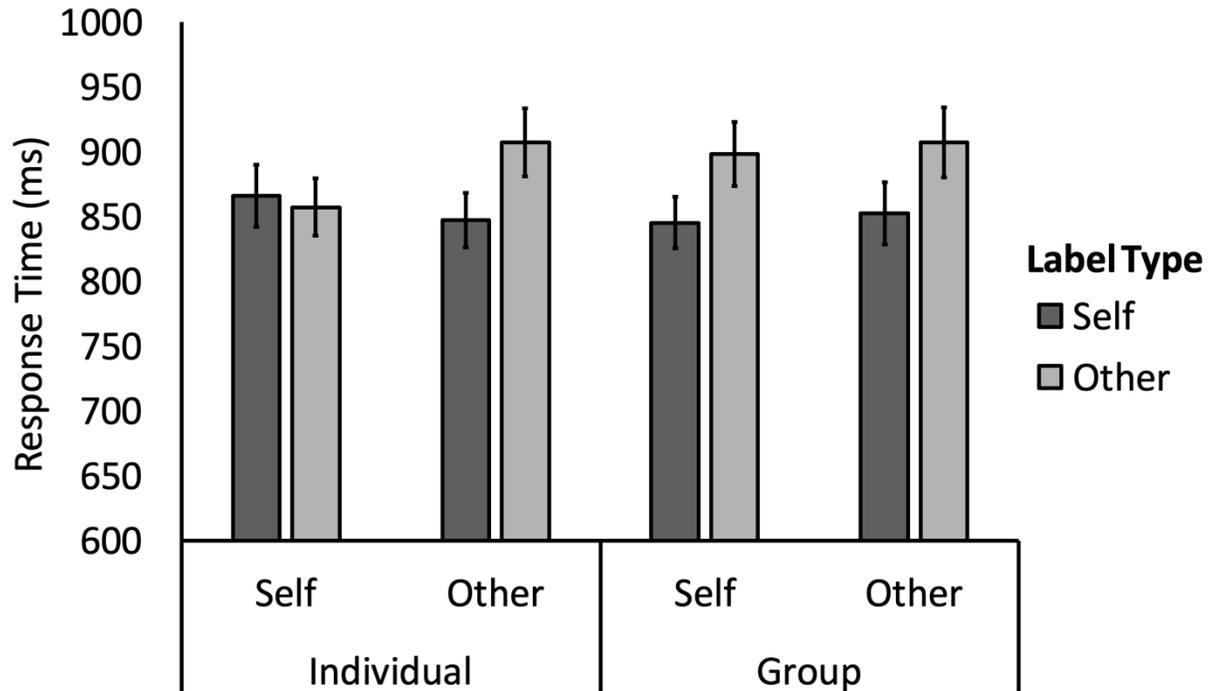
12 and Entity did not reach significance, $ps > .3$. Because the three way interaction was significant,

13 $F(1,27) = 10.96, p = .003, \eta^2 = .29$, we follow up the interaction by focusing on Individual trials

14 and Group trials separately.

1 *Individual Trials.* A 2 (Reference) X 2 (Label) repeated measures ANOVA was
2 conducted on the mismatch trials where the shapes represented only one person. Consistent with
3 the three-way Omnibus ANOVA a main effect of Label was observed, $F(1,27) = 7.98, p = .009,$
4 $\eta^2 = .23$. No effect of Reference was observed, $F(1,27) < 1$, however, an interaction between
5 Label and Reference was observed, $F(1,27) = 17.45, p < .001, \eta^2 = .39$. Follow up t-tests revealed
6 that the self-advantage (50ms) was only present when the label was other-related, $t(27) = 2.28,$
7 $p = .03, d_{av} = .20, 95\% \text{ CI } [0.005, 0.095]$. When the label was self-related no difference was
8 observed between shapes representing self and shapes representing other, $t(27) = -1.64, p = .11,$
9 $d_{av} = -.08, 95\% \text{ CI } [-0.044, 0.005]$, in fact numerically the effect was a disadvantage (-19ms).
10 This pattern of results suggests that any presence of a self-relevant stimulus (whether label or
11 shape) results in a self-advantage because for self-labeled trials even when the shape was other
12 related a self-advantage emerged. Further, regarding the presence of two self-related stimuli (e.g.
13 Shape = Me, Label = We), no support for an additive effect was obtained from a t-test comparing
14 self and other labeled trials in the self-reference condition, $t(27) = .86, p = .40, d_{av} = .04, 95\% \text{ CI } [-$
15 $0.012, 0.029]$. In fact, a Bayesian analysis performed to compare the paired means revealed that
16 the data were 3.55 times more likely under the null hypothesis that there was no difference
17 between these two conditions ($\text{BF}_{10} = 0.28$).

18 *Group Trials.* A 2 (Reference) X 2 (Label) repeated measures ANOVA was conducted on
19 the mismatch trials where the shapes represented a group. In this case only a main effect of Label
20 emerged, $F(1,27) = 20.34, p < .001, \eta^2 = .43$, with reaction times to self-labeled ('We') trials
21 (849ms) being faster than other-labeled ('They') trials (900ms). Neither the effect of Reference
22 nor the interaction reached significance, $F_s < 1$. For group trials, it seems that the label type is
23 the primary driver of any self-benefit.



1

2 *Figure 3.* Reaction Times for Mismatch trials by Reference (Self-referential/Other-referential),

3 Entity (Individual/Group) and Label (Self/Other). Error bars represent Standard Error.

4 ***Sensitivity***

5 We conducted a 2 (Reference) X 2 (Entity) repeated measures ANOVA. A main effect of

6 Reference was observed, $F(1,27) = 24.86, p < .001, \eta^2 = .48$, such that participants exhibited

7 greater sensitivity to self-stimuli than other-stimuli. Neither the main effect of Entity, $F(1,27) =$

8 $1.37, p = .25, \eta^2 = .04$, or the interaction, $F(1,27) = 3.89, p = .06, \eta^2 = .13$, reached significance.

9 This effect is in contrast to the interaction with Entity in the RT measures. We suspect that the

10 reason for this might be that many participants performed at ceiling in the task and thus we were

11 unable to accurately estimate efficiency at the population level. Nevertheless, overall a similar

12 pattern of results was obtained and it is clear that both self-prioritization and we-prioritization

13 manifests in d' .

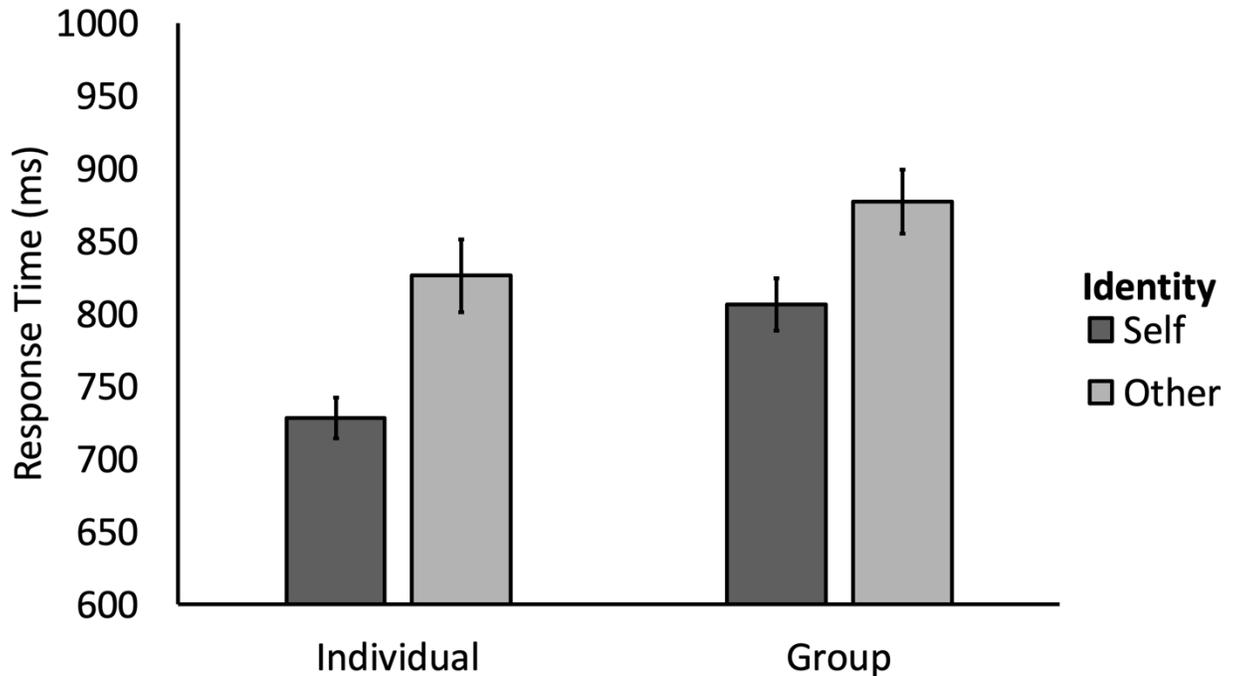
1 between group members. After the group induction, participants experienced the same
2 experimental task as those in Experiment 1.

3 **Results**

4 Data were analyzed in the same way as in Experiment 1. Accuracy was generally high
5 ($M= 90.87\%$, $SD = 6.01\%$) with participants responding faster on self-referential trials than
6 other-referential trials. Trials $3SD$ above or below the participants mean and trials on which no
7 response was made (1.50%) were removed prior to analysis. As with Experiment 1, d' was
8 calculated with corrections to extreme values (Hautus, 1995; Makowski, 2018).

9 ***Match Trials***

10 A 2(Reference) X 2(Entity) repeated measures ANOVA was conducted on matching
11 trials. A main effect of Reference emerged, $F(1,27) = 51.66$, $p < .001$, $\eta^2 = .66$ such that
12 participants responded faster on Self trials (765ms) than on Other trials (849ms). A main effect
13 of Entity was also evident, $F(1,27) = 20.04$, $p < .001$, $\eta^2 = .43$, with participants responding faster
14 on Individual trials (765ms) compared to Group trials (823ms). The absence of an interaction in
15 this data set, $F(1,27) = 0.98$, $p = .33$, $\eta^2 = .04$, is contrary to Experiment 1 where the magnitude of
16 we-prioritization was smaller than the magnitude of self-prioritization. To follow this up, the
17 magnitude of we-prioritization (71ms) was contrasted with self-prioritization (99ms) in a
18 Bayesian analysis. The results of the analysis provided moderate evidence for similarity of
19 magnitude between we-prioritization and self-prioritization in this experiment, $BF_{10} = 0.31$.



1

2 *Figure 4.* Reaction Times for Match trials by Reference (Self/Other) and Entity

3 (Individual/Group). Error bars represent Standard Error.

4 ***Mismatch Trials***

5 A 2(Reference: Self/Other) X 2(Entity: Individual/Group) X 2(Label: Self/Other)

6 repeated measures ANOVA was performed on the data for Mismatch Trials. The only significant

7 main effect observed was that of Label, $F(1,27) = 26.00, p < .001, \eta^2 = .49$, with participants

8 responding faster on trials with a self-label (Me or We) than trials with an other-label (He/She, or

9 They), 864ms and 905ms respectively. Main effects associated with Reference and Entity did not

10 reach significance, $F(1,27) = 2.76, p = .11, \eta_p^2 = .09$ and $F(1,27) = 0.03, p = .87, \eta^2 = .001$

11 respectively. Because the three-way interaction was significant, $F(1,27) = 23.06, p < .001, \eta^2 =$

12 $.46$, we followed up the interaction by focusing on Individual trials and Group trials separately.

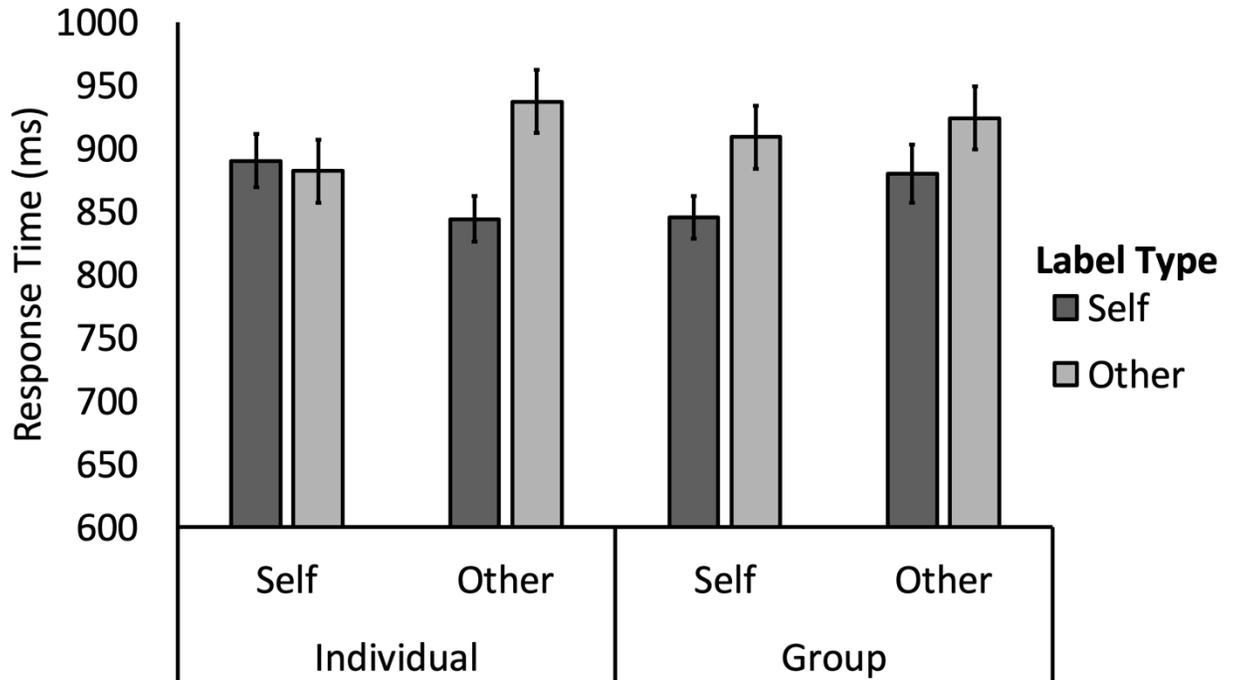
13 *Individual Trials.* A 2 (Reference) X 2 (Label) repeated measures ANOVA was

14 conducted on the mismatch trials where the shapes represented only one person. Consistent with

15 the three-way Omnibus ANOVA, a main effect of Label was observed, $F(1,27) = 17.50, p < .001,$

1 $\eta_p^2 = .39$. No effect of Reference was observed, $F < 1$. However, the main effect of Label was
2 qualified by an interaction between Reference and Label, $F(1,27) = 22.20$, $p < .001$, $\eta^2 = .45$.
3 Follow up t-tests revealed that the self-advantage (55ms) was only present when the label was
4 other related, $t(27) = 2.45$, $p = .02$, $d_{av} = .41$, 95% CI [0.009, 0.101]. When the label was self-
5 related, a significant self-disadvantage (-46) was observed, $t(27) = -4.03$, $p < .001$, $d_{av} = -.45$, 95%
6 CI [-0.069, -0.023]. This pattern of results is consistent with the above conclusions that the label
7 is of critical importance when exploring any effects that bear out of mismatch trials.

8 *Group Trials.* A 2 (Reference) X 2 (Label) repeated measures ANOVA conducted on the
9 mismatch trials where the shapes represented groups. Consistent with the three-way Omnibus
10 ANOVA a main effect of Label was observed, $F(1,27) = 15.02$, $p < .001$, $\eta^2 = .36$, with
11 participants responding faster on self-labeled trials (868ms) than on other-labelled trials (914ms).
12 A main effect of Reference was also observed, $F(1,27) = 7.32$, $p = .01$, $\eta^2 = .21$, with participants
13 responding faster on self-shape trials (886ms) than on other-shape trials (894ms). No interaction
14 was observed, $F < 1$. This pattern of results suggests that at the group level there is a self-
15 advantage associated with both the label and the shape.



1

2 *Figure 5.* Reaction Time for Mismatch trials by Reference (Self/Other), Entity
 3 (Individual/Group), and Label (Self/Other). Error bars represent Standard Error.

4 ***Sensitivity***

5 We conducted a 2 (Reference) X 2 (Entity) repeated measures ANOVA. A main effect of
 6 Reference was observed, $F(1,27) = 25.12, p < .001, \eta^2 = .48$, such that participants exhibited
 7 greater sensitivity to self-stimuli than other-stimuli. A main effect of Entity was also observed,
 8 $F(1,27) = 10.47, p = .003, \eta^2 = .28$, such that participants exhibited greater sensitivity on
 9 Individual trials than on Group trials. The interaction did not reach significance, $F < 1$. The
 10 pattern of results mirrors the results obtained in the RT measure and provides evidence that self-
 11 and we-prioritization can be observed in measures of sensitivity.

12 ***Decision Criterion***

13 We systematically tested each condition for response bias against the test value of 0. No
 14 bias was observed for self-stimuli (Individual: $t(27) = -.56, p = .58, d = -.11, 95\% \text{ CI } [-0.12, 0.06]$,
 15 Group: $t(27) = -0.69, p = .50, d = -.13, 95\% \text{ CI } [-0.15, 0.07]$). However, on trials with ‘other’

1 stimuli participants had a significant bias to respond ‘Match’ (Individual: $t(27) = 3.17, p=.004, d$
2 $=.60, 95\% \text{ CI } [0.04,0.17]$, Group: $t(27) = 2.66, p=.01, d =.50, 95\% \text{ CI } [0.03, 0.20]$).

3 **Experiment 3**

4 Experiment 2 demonstrated that we-prioritization occurs independently of shared
5 preferences. However, in both experiments, participants had knowledge of who the other
6 individual group members were. Does we-prioritization also occur for generic groups where
7 individual group members are not known? To address this question, we tested whether we-
8 prioritization can manifest in the case of disembodied pronouns. When reading the pronoun ‘we’
9 an exemplar concept of the self and group should be activated even though the individual group
10 members are unknown (Tulving, Schacter, & Stark, 1982). If we-prioritization reflects a general
11 tendency in cognition, then we-matches should still be processed faster than they-matches under
12 these conditions.

13 **Method**

14 **Participants.**

15 The participants were 28 native Hungarian speakers aged 18 to 31 ($M = 22.68, SD = 2.82,$
16 8). They participated in the experiment in exchange for 1500 HUF worth of supermarket
17 vouchers. All participants had normal or corrected to normal vision.

18 **Stimuli, Apparatus, Procedure and Design.**

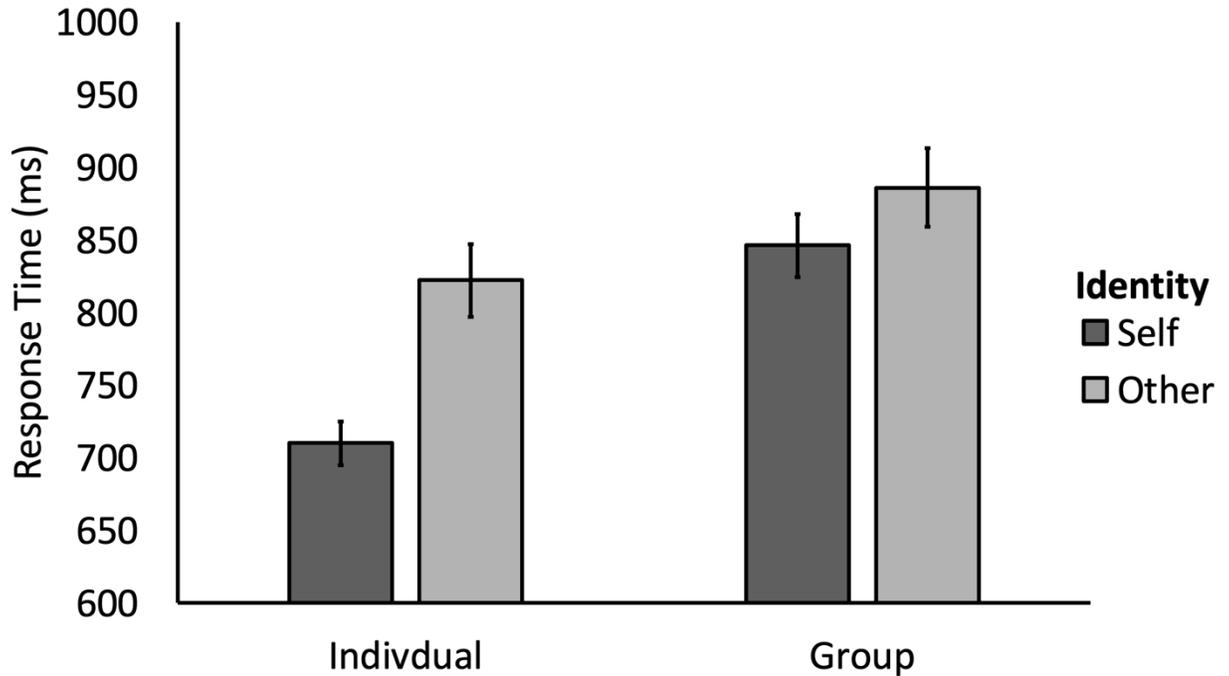
19 The experiment was identical to previous experiments, except that there was no group
20 induction whatsoever. Participants only saw the labels during the association phase, and they
21 were not told specifically that they were a part of a defined group. Thus, group membership was
22 defined by arbitrary links between shapes and the familiar meaning of personal pronouns.

1 **Results**

2 The data were analyzed as in the previous experiments. Accuracy was generally high ($M=$
3 88.67% , $SD = 7.74$) with participants performing more accurately on self-trials than other-trials.
4 Trials $3SD$ above or below the participants mean and trials on which no response was made
5 (1.66%) were removed prior to analysis. As with Experiment 1, d' was calculated with
6 corrections to extreme values (Hautus, 1995; Makowski, 2018).

7 ***Match Trials***

8 A 2(Reference) X 2(Entity) repeated measures ANOVA was conducted on matching
9 trials. A main effect of Reference, $F(1, 27) = 17.87$, $p < .001$, $\eta^2 = .40$ emerged. Participants
10 responded faster on Self trials (774ms) than on Other trials (852ms). A main effect of Entity also
11 emerged, $F(1,27) = 35.01$, $p < .001$, $\eta^2 = .57$, with participants responding faster on Individual
12 (760ms) than on Group trials (863ms). These main effects were qualified by an interaction,
13 $F(1,27) = 7.32$, $p = .01$, $\eta^2 = .21$. The source of this interaction was a larger self-advantage for
14 Individual trials (112ms) than for Group trials (40ms), $t(27) = 2.71$, $p = .01$, $d_{av} = .62$, 95%
15 CI[0.02, 0.13]. Again, the presence of we-prioritization was confirmed with a t-test, $t(27) = 2.07$,
16 $p = .048$, $d_{av} = .30$, 95% CI[$3.783e^{-4}$, 0.08]. The pattern of results indicates that pronouns
17 referring to a generic group one belongs to are sufficient to induce we-prioritization.



1

2 *Figure 6.* Reaction Times for Match trials by Reference (Self/Other) and Entity

3 (Individual/Group). Error bars represent Standard Error.

4 ***Mismatch Trials***

5 A 2(Reference: Self/Other) X 2(Entity: Individual/Group) X 2(Label: Self/Other)

6 repeated measures ANOVA was performed on the data for Mismatch Trials. The only significant

7 main effect observed was that of Label, $F(1,27) = 56.83, p < .001, \eta^2 = .68$, with participants

8 responding faster on trials with a self-label (Me or We) than on trials with an other-label

9 (He/She, or They), 855ms and 915ms respectively. Main effects associated with Reference and

10 Entity did not reach significance, $F(1,27) = .13, p = .72, \eta^2 = .005$ and $F(1,27) = 1.03, p = .32, \eta^2 =$

11 $.037$ respectively. Because the three-way interaction was significant, $F(1,27) = 12.27, p = .002,$

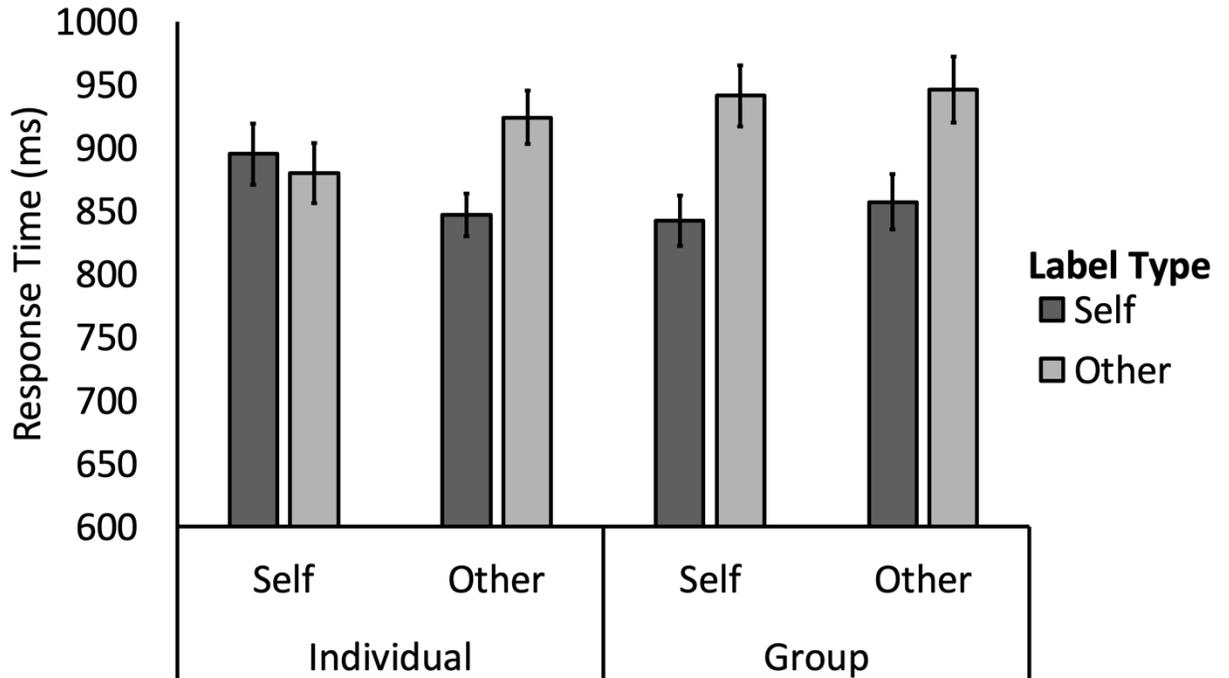
12 $\eta^2 = .31$, we followed up the interaction by focusing on Individual trials and Group trials

13 separately.

1 *Individual Trials.* A 2 (Reference) X 2 (Label) repeated measures ANOVA was
2 conducted on the mismatch trials where the shapes represented only one person. Consistent with
3 the three-way Omnibus ANOVA, a main effect of Label was observed, $F(1,27) = 12.51, p < .001,$
4 $\eta^2 = .32.$ No effect of Reference was observed, $F < 1.$ However, the main effect of Label was
5 qualified by an interaction between Reference and Label, $F(1,27) = 14.34, p < .001, \eta^2 = .35.$
6 Follow up t-tests revealed that the self-advantage (44ms) was only present when the label was
7 other related, $t(27) = 2.31, p = .03, d_{av} = .37, 95\% \text{ CI } [0.005, 0.082].$ When the label was self-
8 related a significant self-disadvantage (-48) was observed, $t(27) = -2.41, p = .02, d_{av} = -.44, 95\%$
9 $\text{CI } [-0.089, -0.007].$

10 *Group Trials.* A 2 (Reference) X 2 (Label) repeated measures ANOVA was conducted on
11 the mismatch trials where the shapes represented groups. Consistent with the three-way Omnibus
12 ANOVA, a main effect of Label was observed, $F(1,27) = 48.73, p < .001, \eta^2 = .64,$ with
13 participants responding faster on self-labeled trials (851ms) than on other-labelled trials (941ms).
14 Consistent with Experiment 1, neither the main effect of shape nor the interaction reached
15 significance, $F_s < 1.$ Overall, the results suggest that in the case of group trials the label is a
16 primary driver of self-processing benefits.

17



1

2 *Figure 7.* Reaction Time for Mismatch trials by Reference (Self/Other), Entity
 3 (Individual/Group), and Label (Self/Other). Error bars represent Standard Error.

4 ***Sensitivity***

5 We conducted a 2 (Reference) X 2 (Entity) repeated measures ANOVA. A main effect of
 6 Reference was observed, $F(1,27) = 9.44, p = .005, \eta^2 = .26$, such that participants exhibited
 7 greater sensitivity to self-stimuli than other-stimuli. A main effect of Entity was also observed,
 8 $F(1,27) = 29.58, p < .001, \eta^2 = .52$, such that participants exhibited greater sensitivity on
 9 Individual trials than on Group trials. The interaction did not reach significance, $F(1,27) = 2.82,$
 10 $p = .10, \eta^2 = .10$. This pattern of results mirrors those obtained in Experiment 2. Similar to
 11 Experiment 1, the interaction observed in RT was not observed in sensitivity. We suggest this
 12 might be the result of ceiling level performance for many subjects.

13 ***Decision Criterion***

14 We systematically tested each condition for response bias against the test value of 0. No
 15 bias was observed for self-stimuli (Individual: $t(27) = -1.09, p = .29, d = -0.21, 95\% \text{ CI } [-0.17,$

1 0.05], Group: $t(27) = -0.97, p = .34, d = -0.18, 95\% \text{ CI } [-0.13, 0.05]$). No significant bias was
2 observed for ‘You’ stimuli either, $t(27) = 0.86, p = .40, d = .16, 95\% \text{ CI } [-0.06, 0.15]$ but ‘They’
3 trials did produce a significant bias in favor of the ‘Match’ response, $t(27) = 3.02, p = .005, d$
4 $= .57, 95\% \text{ CI } [0.04, 0.20]$).

5 **Experiment 4**

6 Experiments 1, 2, and 3 demonstrated reliable we-prioritization that was generally
7 smaller in magnitude than self-prioritization. We-prioritization was even observed when there
8 was no indication of who the pronouns referred to (Experiment 3). Evidence of a consistent we-
9 prioritization effect then begs the question of whether we-prioritization extends to individual
10 members of the group. Previous work has suggested that the mother- and best-friend
11 prioritization that is occasionally observed stems from the fact that close personal others are
12 integrated into the self. If we-prioritization can be characterized as stemming from self-
13 prioritization because the group includes the self, prioritization should be observed for the
14 assigned team-member’s stimulus because the team-member should also fit the assumption of an
15 extended self through being incorporated into the ‘we’. On the other hand, if we-prioritization
16 stems from a general tendency to prioritize information relevant for collaboration then only
17 information that is relevant for the self or the group should be prioritized (‘self’ and ‘team’, but
18 not ‘assigned team-member’). To this end, participants were told that they were in a team
19 together (Blue or Yellow Team) and that they would be performing the task together. In order to
20 test the above hypotheses, we adapted the matching task such that one participant in a dyad
21 responded to Match trials and the other to Mismatch trials. Therefore, the two participants in a
22 dyad performed complementary go/no-go tasks. We evaluated responses to Self, assigned team-
23 member (henceforth Co-actor) and Stranger stimuli. We also evaluated responses to Own Team

1 and Other Team separately to confirm the existence of we-prioritization. A second aim of
2 Experiment 4 was to generalize the findings of the previous experiments to a go/no-go task that
3 was more akin to real world transitory groups that are formed in order to complete a task via
4 complementary actions.

5 **Method**

6 **Participants.**

7 Twenty adult pairs aged 20 to 36 ($M = 25.43$, $SD = 3.76$) volunteered to participate in the
8 study in exchange for supermarket vouchers (1500HUF). Fourteen were male and twenty-six
9 were female. All participants had normal or corrected to normal vision and could speak English.
10 Based upon the critical comparison of interest (RT toward co-actor vs stranger stimuli), 20
11 participants (who respond on match trials) will provide an implied power of 81% power for the
12 medium effect sizes ($d_z = .5$) that we-prioritization demonstrated.

13 **Procedure.**

14 ***Shape Assignment and Training.***

15 Pairs were instructed that they would be performing a task together. They were told that
16 Person 1 and Person 2 (as indicated by a card in front of them) would be represented each by a
17 given shape. They were also told that a stranger would be represented by a given shape, and that
18 their team (the pair of participants, Blue/Yellow team counterbalanced) and another team
19 (Blue/Yellow team, counterbalanced) would be represented each by a given shape. The shapes
20 (Triangle, Diamond, Circle, Pentagon, and Star) were randomly allocated to each individual or
21 team.

22 Participants then performed a training session (50 trials) to ensure that all stimulus
23 mappings were committed to memory. Participants were posed with the question ‘*Who does this*

1 *stimulus represent?* and the shape (in text) appeared below the question. Participants indicated if
2 the type of stimulus represented ‘Person 1’, ‘Person 2’, their team (e.g. ‘Yellow Team’), the
3 ‘Stranger’ or the stranger team (e.g. ‘Blue Team’) using the ‘c’, ‘v’, ‘b’, ‘n’, and ‘m’ keys
4 (response mappings randomized and displayed on screen). Pronouns were no longer used
5 because five different pronouns that would account for all identities were not available and it was
6 necessary to distinguish between the two participants in the dual task (‘Me’ would be
7 ambiguous). Participants were asked to decide on the answer together and confirm with each
8 other before making a response. On average, pairs achieved high accuracy on this task
9 (M=97.60%, SD=3.70%).

10 ***Matching Task.***

11 Using the above labels rather than original pronouns, a given trial proceeded the same as
12 in the other three experiments but for the fact that one participant was required to respond on
13 match trials and one was required to respond on mismatch trials (using ‘z’ and ‘number pad 3’
14 keys, counterbalanced between pairs). If both participants responded, the first key press was
15 taken as the response and feedback was given accordingly. After 21 or 41 practice trials
16 (depending on the pair’s confidence in the task) the practice was terminated, and participants
17 completed 8 blocks of 80 trials. Participants were given feedback regarding the percentage of
18 trials on which they (as a pair) answered correctly after each block. The factors of location,
19 stimulus, label were fully counterbalanced and randomized within a block. The whole
20 experiment was conducted in English.

21 **Results.**

22 Both the raw data, and data submitted to inferential statistics have been uploaded to the
23 OSF.

1 Accuracy and sensitivity cannot be accurately determined in a dual task where the
2 individual task requires the participant to either initiate a response or inhibit a response and the
3 co-actor's responses could disrupt the determination of hits, misses, false alarms, and correct
4 rejections. Therefore, our analyses are only on the mean RT from correct trials for both
5 individual (self, co-actor, stranger) and group (Self Team, Stranger Team) trials separately.

6 ***Individual Entities.***

7 In line with previous experiments, response times for match and mismatch trials were
8 submitted to two separate one-way ANOVAs.

9 **Match Participant.** A main effect of identity was revealed, $F(2,38) = 6.88, p = .003, \eta^2 =$
10 $.27$. Follow-up comparisons revealed that response times to self-stimuli (670ms) were
11 significantly faster than both Co-actor (744ms), $t(19) = 3.26, p = .004, d_{av} = .59, 95\% \text{ CI } [0.03,$
12 $0.12]$ and Stranger stimuli (728ms), $t(19) = 2.50, p = .02, d_{av} = .50, 95\% \text{ CI } [0.009, 0.11]$. Co-actor
13 and Stranger stimuli were not observed to differ from each other, $t(19) = 0.97, p = .34, d_{av} = .12,$
14 $95\% \text{ CI } [-0.02, 0.05]$, see Figure 8. In light of the null effect and the relevance to our hypothesis,
15 we directly tested for the presence of 'co-actor-prioritization' which would be expected if the
16 group was represented as a part of the extended self with a Bayesian paired t-test (JASP Team,
17 2018). In actuality, the data were 7.71 times more likely under the hypothesis that participants
18 would *not* respond faster to the co-actor stimulus ($\text{BF}_{10} = 0.13$).

19 **Mismatch Participant.** Responses to Self, Co-actor and Stranger trials did not
20 significantly differ for the mismatch responding participant, $F(2,38) < 1$. This result is consistent
21 with the broader literature that employs the present matching task and generally demonstrates an
22 absence of prioritization in Mismatch trials.

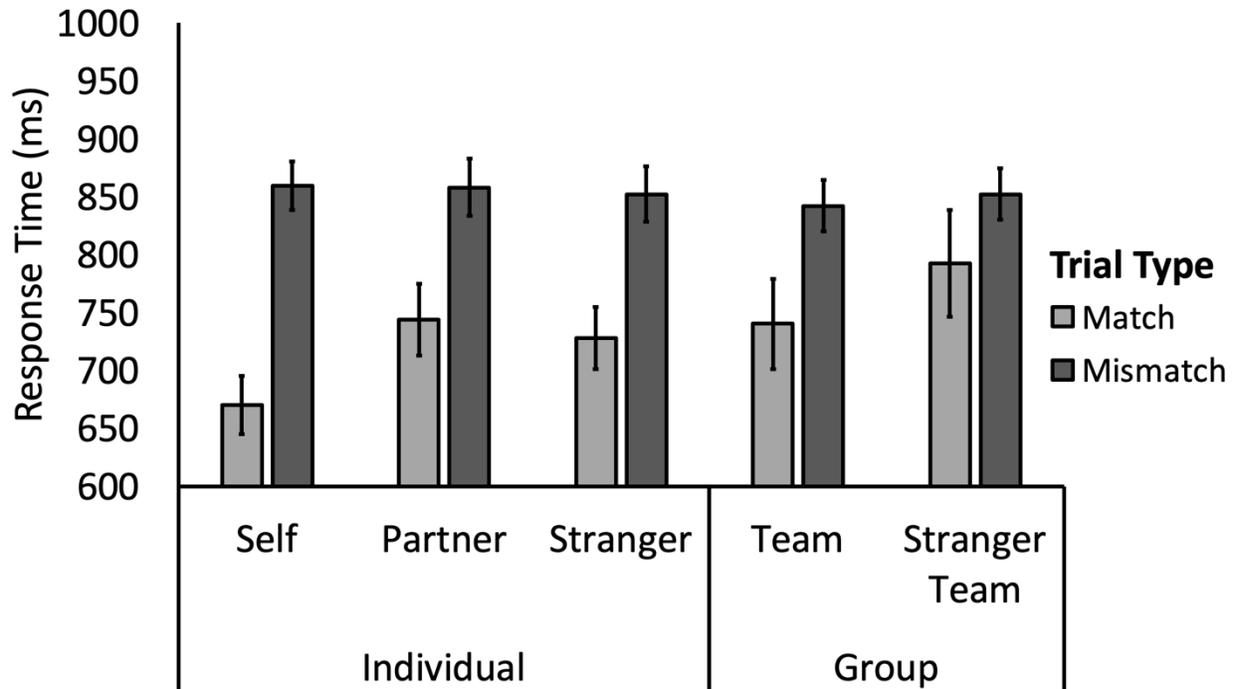
1 ***Group Entities.***

2 Again, response times from the ‘Match’ participant and the ‘Mismatch’ participant were
3 submitted to two separate paired t-tests to confirm the existence of we-prioritization.

4 **Match Participant.** Match participants demonstrated a significant we-prioritization
5 effect (Own Team: 740ms, Stranger Team: 792ms), $t(19) = 2.65, p=.02, d_{av} = .27, 95\% \text{ CI } [0.01,$
6 $0.09]$. Therefore, Experiment 4 replicates the we-prioritization that was found in Experiments 1,
7 2, and 3.

8 **Mismatch Participant.** Similarly to the mismatch trials for the individual entities, no
9 difference in response time was observed for responses to Team and Stranger Team stimuli, $t(19)$
10 $= 0.86, p=.40, d_{av} = .09, 95\% \text{ CI } [-0.01, 0.03]$. Thus, the pattern of results for mismatch trials is
11 consistent with the broader literature that generally demonstrates an absence of prioritization in
12 mismatch trials.

13 Overall, the results from Experiment 4 are inconsistent with the notion that we-
14 prioritization stems from self-prioritization through an extended self-framework because if this
15 were the case we would expect to see that any identity that was connected to the ‘we’ would also
16 be prioritized through links to the extended self. In fact, the co-actor’s stimulus was not
17 prioritized over the stranger stimulus.



1

2 *Figure 8.* Reaction Time for Match and Mismatch trials by Identity (Self/Co-
 3 actor/Stranger/Team/Stranger Team) and Trial Type (Match/Mismatch). Error bars represent
 4 Standard Error.

5 **General Discussion**

6 The aim of the present study was to investigate whether humans preferentially process
 7 information associated with a group they belong to. Across four experiments, we obtained robust
 8 effects of we-prioritization: participants were faster to report whether a label and a shape were
 9 matching when they referred to a group they belonged to (we) than when they referred to a group
 10 they did not belong to. The data also provided evidence of we-prioritization in sensitivity (d').
 11 Interestingly, such we-prioritization did not extend to individual members of the group in
 12 Experiment 4. The finding that we-match trials elicited faster response times than they-match
 13 trials in all four experiments indicates that neither knowing individual group members of one's
 14 own group nor sharing preferences with these members was a necessary precondition for we-

1 prioritization to occur. Rather, a reference to self being a member of a generic group (labeled
2 ‘we’) was sufficient to enable prioritization of incoming information.

3 The results from Experiment 1, 2 and 3 can be accommodated within self-models of
4 cognitive processing (Humphreys & Sui, 2016; Symons & Johnson, 1997) by viewing the
5 collective as integrated within the self-representation (Ray et al., 2009; Schäfer et al., 2017) or
6 connected to the self-representation (Bower & Gilligan, 1979; Symons & Johnson, 1997). The
7 results from Experiment 4, however, seem to be inconsistent with these models. If ‘we’ is
8 represented as an extension of the self, as has been suggested about ‘mother’ and ‘best friend’
9 (Schäfer et al., 2017), then an assigned team-member should also be prioritized because the
10 team-member (co-actor in this case) is connected to or integrated with ‘we’. Because co-actor-
11 prioritization was not observed, we suggest that we-prioritization may reflect the activation of an
12 attentional control set established on the basis of prior expectations for motivationally relevant
13 stimuli and this might occur independently of any self-association. This explanation is consistent
14 with the idea that humans may have a predisposition to seek and respond to information that
15 provides collaborative opportunities.

16 The absence of a co-actor-prioritization effect in Experiment 4 suggests an interesting
17 caveat for the extended self-framework. The extended-self-effect might only occur when there is
18 a stable association between the self and the other identity. Regarding the present work, the
19 participants’ co-actor is an individual who the participant is unlikely to meet or interact with
20 again, and the ‘team’ is not an established and continuing entity either. This other person (and
21 team) may not be integrated into the self-semantic network because there is little reason to
22 encode the person and group in memory as connected to the self. Such reasoning provides new
23 hypotheses regarding established versus transient ad hoc teams. Specifically, for established

1 stable teams or groups, such as a work place or soccer team, team-member-prioritization and
2 team-prioritization might manifest because the group and subsequently group-members become
3 well connected to the self within working memory. Indeed, it would be adaptive to strongly
4 represent both information relevant to a stable and established long term group as well as
5 information relevant to the individual group members because such information would be useful
6 for ongoing repeated interactions. In this sense it would be interesting to determine if co-actor-
7 prioritization might begin to manifest over the course of an extended lab-based experiment that
8 required repeated interactions and thus repeated opportunities to develop a strong representation
9 of group representation within memory.

10 We also find group identity to be a promising area for future research concerning group-
11 based prioritization and representations. Previous analyses on established teams have provided
12 initial support for the notion that the level of identity fusion (Gómez, Brooks, Buhrmester, Jetten,
13 & Swann, 2011) with a group might influence overlap in newly encoded self and team
14 representations (Enock et al., 2018). Specifically, Enock and colleagues (2018) found that the
15 difference between self-team and self-rival mismatching trials correlated with identity fusion
16 measures. Nevertheless, the prioritization effect (match trials) did not correlate with identity
17 fusion measures. More work will need to be conducted in order to determine if and how identity
18 fusion might have an impact upon prioritization processes. For example, much of the identity
19 fusion literature is discussed in terms of well-established groups that individuals experience over
20 very long periods of time (e.g. nationality) or strong experiences that result in strong
21 identification with group members (e.g. going on tour with the military). In this sense, it might
22 be interesting to determine if we-prioritization and team-member-prioritization occurs to the

1 same level of self-prioritization in demonstrably highly fused individuals or whether the
2 observed absence of co-actor prioritization is retained.

3 Not surprisingly, self-prioritization was observed across all four experiments. This
4 validates our assumption that, despite the different materials (labels and language) and
5 participant pool, all four experiments would provide clear replications of the self-prioritization
6 effects observed in prior research (Sui et al., 2012). Intriguingly, in experiments where we
7 controlled the labels in order to compare the magnitude of the self- and we-prioritization effects
8 (Experiments 1, 2, and 3) the self-prioritization effect was generally larger than the we-
9 prioritization effect (significant in Experiments 1 and 3), which is perhaps consistent with the
10 notion that ‘we’ stimuli are not benefiting from the host of self-benefits that have been theorized
11 to result from the presence of self-stimuli.

12 The first three experiments also present a unique opportunity to evaluate effects self-
13 shape versus self-label effects by looking at the mismatch trials. Within the self-prioritization
14 literature very little attention has been given to mismatch trials, likely because they typically do
15 not show prioritization effects, or inconsistent results. If we look specifically at the Group
16 Mismatch trials, the results seem to converge upon the conclusion that the self-label facilitates
17 processing. The results are less consistent in terms of the individual trials. In this case, it seems
18 that the presence of a self-stimulus (whether it be a shape or a label) results in a boost to
19 processing. The extra boost for the ‘You’ shape when paired with the ‘Me’ label might indicate
20 that the ‘Me’ label is a very potent stimulus for eliciting the self-prioritization effect over a self-
21 related stimulus. Indeed, previous work has shown response time benefits for personal pronouns
22 in isolation (Shi, Zhou, Han, & Liu, 2011). Nevertheless, recent work using both arbitrary labels

1 and stimuli demonstrates that the self-prioritization effect cannot be distilled solely down to the
2 self-association of the label (Woźniak & Knoblich, 2019).

3 The present series of experiments demonstrated a consistent we-prioritization effect that
4 was generally smaller in magnitude than the self-prioritization effect. We-prioritization persisted
5 even when the concept of ‘we’ was minimally activated through only the use of a personal
6 pronoun that did not specifically refer to a known group. The first three experiments could be
7 interpreted in two ways. First, we-prioritization could have been an extension of self-
8 prioritization by virtue of its close link to ‘me’ within self-networks. Or, second, we-
9 prioritization could have been associated with top-down facilitation for motivationally relevant
10 stimuli. Experiment 4 specifically tested the first interpretation by evaluating responses to a co-
11 actor’s stimulus. The observed absence of co-actor-prioritization in the present data was
12 inconsistent with an extended self-explanation because ‘co-actor’ is linked with the group which
13 is linked with the self. Although the extended self-framework might explain team-prioritization
14 very well in the context of stable long-term teams that have the opportunity to be well integrated
15 with the ‘self’, we suggest that the short term ad hoc groups that humans create on a day to day
16 basis may not have the opportunity to be grounded in terms of the self. Thus, we suggest that we-
17 prioritization elicited in response to the present transitory teams is better grounded in terms of
18 joint action processes that support collaborative opportunities.

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Ethical Declaration

For all experiments all participants provided written informed consent prior to testing. The procedures were approved by the local ethics committee (United Ethical Review Committee for Research in Psychology [EPKEB]) and complied with the ethical standards outlined in the Declaration of Helsinki (1964).

1 **References**

- 2 Bower, G. H., & Gilligan, S. G. (1979). Remembering information related to one's self. *Journal*
3 *of Research in Personality*, 13(4), 420–432. <https://doi.org/10.1016/0092->
4 [6566\(79\)90005-9](https://doi.org/10.1016/0092-6566(79)90005-9)
- 5 Brass, M., Bekkering, H., Wohlschläger, A., & Prinz, W. (2000). Compatibility between
6 observed and executed finger movements: comparing symbolic, spatial, and imitative
7 cues. *Brain and Cognition*, 44(2), 124–143. <https://doi.org/10.1006/brcg.2000.1225>
- 8 Brédart, S., Delchambre, M., & Laureys, S. (2006). One's Own Face Is Hard to Ignore.
9 *Quarterly Journal of Experimental Psychology*, 59(1).
10 <https://doi.org/10.1080/17470210500343678>
- 11 Constable, M. D., de Grosbois, J., Lung, T., Tremblay, L., Pratt, J., & Welsh, T. N. (2017). Eye
12 movements may cause motor contagion effects. *Psychonomic Bulletin & Review*, 24(3),
13 835–841. <https://doi.org/10.3758/s13423-016-1177-4>
- 14 Constable, M. D., Pratt, J., Gozli, D. G., & Welsh, T. N. (2015). Do you see what I see? Co-actor
15 posture modulates visual processing in joint tasks. *Visual Cognition*, 23(6), 699–719.
16 <https://doi.org/10.1080/13506285.2015.1078426>
- 17 Constable, M. D., Pratt, J., & Welsh, T. N. (2018). “Two Minds Don't Blink Alike”: The
18 Attentional Blink Does Not Occur in a Joint Context. *Frontiers in Psychology*, 9.
19 <https://doi.org/10.3389/fpsyg.2018.01714>
- 20 Constable, M. D., Rajsic, J., Welsh, T. N., & Pratt, J. (2019). It is not in the details: Self-related
21 shapes are rapidly classified but their features are not better remembered. *Memory &*
22 *Cognition*. <https://doi.org/10.3758/s13421-019-00924-6>

- 1 Constable, M. D., Welsh, T. N., Huffman, G., & Pratt, J. (2019). I before U: Temporal order
2 judgements reveal bias for self-owned objects. *Quarterly Journal of Experimental*
3 *Psychology*, 72(3), 589–598. <https://doi.org/10.1177/1747021818762010>
- 4 Elekes, F., Bródy, G., Halász, E., & Király, I. (2016). Enhanced encoding of the co-actor's target
5 stimuli during a shared non-motor task. *Quarterly Journal of Experimental Psychology*
6 (2006), 69(12), 2376–2389. <https://doi.org/10.1080/17470218.2015.1120332>
- 7 Enock, F., Sui, J., Hewstone, M., & Humphreys, G. W. (2018). Self and team prioritisation
8 effects in perceptual matching: Evidence for a shared representation. *Acta Psychologica*,
9 182, 107–118. <https://doi.org/10.1016/j.actpsy.2017.11.011>
- 10 Gallotti, M., & Frith, C. D. (2013). Social cognition in the we-mode. *Trends in Cognitive*
11 *Sciences*, 17(4), 160–165. <https://doi.org/10.1016/j.tics.2013.02.002>
- 12 Gilbert, M. (1989). *On Social Facts*. Princeton: Princeton University Press.
- 13 Golubickis, M., Falben, J. K., Sahraie, A., Visokomogilski, A., Cunningham, W. A., Sui, J., &
14 Macrae, C. N. (2017). Self-prioritization and perceptual matching: The effects of
15 temporal construal. *Memory & Cognition*, 45(7), 1223–1239.
16 <https://doi.org/10.3758/s13421-017-0722-3>
- 17 Gómez, A. N., Brooks, M. L., Buhrmester, M. D., Jetten, J., & Swann, W. B. (2011). On the
18 nature of identity fusion: Insights into the construct and a new measure. *Journal of*
19 *Personality and Social Psychology*, 10–1037.
- 20 Hautus, M. J. (1995). Corrections for extreme proportions and their biasing effects on estimated
21 values of d'. *Behavior Research Methods, Instruments, & Computers*, 27(1), 46–51.
22 <https://doi.org/10.3758/BF03203619>

- 1 Humphreys, G. W., & Sui, J. (2016). Attentional control and the self: The Self-Attention
2 Network (SAN). *Cognitive Neuroscience*, 7(1–4), 5–17.
3 <https://doi.org/10.1080/17588928.2015.1044427>
- 4 JASP Team. (2018). *JASP (Version 0.9)*.
- 5 Klein, S. B., & Kihlstrom, J. F. (1986). Elaboration, organization, and the self-reference effect in
6 memory. *Journal of Experimental Psychology. General*, 115(1), 26–38.
7 <https://doi.org/10.1037/0096-3445.115.1.26>
- 8 Klein, S. B., & Loftus, J. (1988). The nature of self-referent encoding: The contributions of
9 elaborative and organizational processes. *Journal of Personality and Social Psychology*,
10 55(1), 5–11. <https://doi.org/10.1037/0022-3514.55.1.5>
- 11 Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: a
12 practical primer for t-tests and ANOVAs. *Frontiers in Psychology*, 4.
13 <https://doi.org/10.3389/fpsyg.2013.00863>
- 14 Loehr, J. D., Sebanz, N., & Knoblich, G. (2013). Joint Action: From Perception-Action Links to
15 Shared Representations. In W. Prinz, M. Beisert, & A. Herwig (Eds.), *Action Science* (pp.
16 333–356). <https://doi.org/10.7551/mitpress/9780262018555.003.0013>
- 17 Makowski, D. (2018, February 5). The psycho Package: an Efficient and Publishing-Oriented
18 Workflow for Psychological Science. <https://doi.org/10.21105/joss.00470>
- 19 Moradi, Z., Sui, J., Hewstone, M., & Humphreys, G. W. (2015). In-group modulation of
20 perceptual matching. *Psychonomic Bulletin & Review*, 22(5), 1255–1277.
21 <https://doi.org/10.3758/s13423-014-0798-8>

- 1 Pinter, B., & Greenwald, A. G. (2011). A comparison of minimal group induction procedures.
2 *Group Processes & Intergroup Relations*, 14(1), 81–98.
3 <https://doi.org/10.1177/1368430210375251>
- 4 Postmes, T., Spears, R., Lee, A. T., & Novak, R. J. (2005). Individuality and Social Influence in
5 Groups: Inductive and Deductive Routes to Group Identity. *Journal of Personality and*
6 *Social Psychology*, 89(5), 747–763. <https://doi.org/10.1037/0022-3514.89.5.747>
- 7 Ray, R. D., Shelton, A. L., Hollon, N. G., Michel, B. D., Frankel, C. B., Gross, J. J., & Gabrieli,
8 J. D. E. (2009). Cognitive and Neural Development of Individuated Self-Representation
9 in Children. *Child Development*, 80(4), 1232–1242. <https://doi.org/10.1111/j.1467->
10 [8624.2009.01327.x](https://doi.org/10.1111/j.1467-8624.2009.01327.x)
- 11 Sacheli, L. M., Arcangeli, E., & Paulesu, E. (2018). Evidence for a dyadic motor plan in joint
12 action. *Scientific Reports*, 8(1). <https://doi.org/10.1038/s41598-018-23275-9>
- 13 Samson, D., Apperly, I. A., Braithwaite, J. J., Andrews, B. J., & Bodley Scott, S. E. (2010).
14 Seeing it their way: Evidence for rapid and involuntary computation of what other people
15 see. *Journal of Experimental Psychology: Human Perception and Performance*, 36(5),
16 1255–1266. <https://doi.org/10.1037/a0018729>
- 17 Schäfer, S., Wentura, D., & Frings, C. (2017). Distinctiveness effects in self-prioritization.
18 *Visual Cognition*, 25(1–3), 399–411. <https://doi.org/10.1080/13506285.2017.1346739>
- 19 Sebanz, N., Bekkering, H., & Knoblich, G. (2006). Joint action: bodies and minds moving
20 together. *Trends in Cognitive Sciences*, 10(2), 70–76.
21 <https://doi.org/10.1016/j.tics.2005.12.009>
- 22 Sebanz, N., Knoblich, G., & Prinz, W. (2003). Representing others' actions: just like one's own?
23 *Cognition*, 88(3), B11–B21. [https://doi.org/10.1016/S0010-0277\(03\)00043-X](https://doi.org/10.1016/S0010-0277(03)00043-X)

- 1 Shi, Z., Zhou, A., Han, W., & Liu, P. (2011). Effects of ownership expressed by the first-person
2 possessive pronoun. *Consciousness and Cognition*, 20(3), 951–955.
3 <https://doi.org/10.1016/j.concog.2010.12.008>
- 4 Sui, J., He, X., & Humphreys, G. W. (2012). Perceptual effects of social salience: Evidence from
5 self-prioritization effects on perceptual matching. *Journal of Experimental Psychology:*
6 *Human Perception and Performance*, 38(5), 1105–1117.
7 <https://doi.org/10.1037/a0029792>
- 8 Sui, J., Zhu, Y., & Han, S. (2006). Self-face recognition in attended and unattended conditions:
9 An event-related brain potential study. *NeuroReport: For Rapid Communication of*
10 *Neuroscience Research*, 17(4), 423–427.
11 <https://doi.org/10.1097/01.wnr.0000203357.65190.61>
- 12 Symons, C. S., & Johnson, B. T. (1997). The self-reference effect in memory: a meta-analysis.
13 *Psychological Bulletin*, 121(3), 371–394.
- 14 Tajfel, H. (1970). Experiments in Intergroup Discrimination. *Scientific American*, 223(5), 96–
15 102. <https://doi.org/10.1038/scientificamerican1170-96>
- 16 Thomaz, C. E., & Giraldi, G. A. (2010). A new ranking method for principal components
17 analysis and its application to face image analysis. *Image and Vision Computing*, 28(6),
18 902–913. <https://doi.org/10.1016/j.imavis.2009.11.005>
- 19 Tomasello, M. (2014). *A natural history of human thinking*. Cambridge, Massachusetts: Harvard
20 University Press.
- 21 Truong, G., Roberts, K. H., & Todd, R. M. (2017). I saw mine first: A prior-entry effect for
22 newly acquired ownership. *Journal of Experimental Psychology. Human Perception and*
23 *Performance*, 43(1), 192–205. <https://doi.org/10.1037/xhp0000295>

- 1 Tulving, E., Schacter, D. L., & Stark, H. A. (1982). Priming effects in word-fragment completion
2 are independent of recognition memory. *Journal of Experimental Psychology: Learning,*
3 *Memory, and Cognition*, 8(4), 336–342. <https://doi.org/10.1037/0278-7393.8.4.336>
- 4 Tuomela, R. (2006). Joint Intention, We-Mode and I-Mode. *Midwest Studies In Philosophy*,
5 30(1), 35–58. <https://doi.org/10.1111/j.1475-4975.2006.00127.x>
- 6 van der Wel, R. P. R. D., & Fu, E. (2015). Entrainment and task co-representation effects for
7 discrete and continuous action sequences. *Psychonomic Bulletin & Review*, 22(6), 1685–
8 1691. <https://doi.org/10.3758/s13423-015-0831-6>
- 9 Vesper, C., & Sebanz, N. (2016). Acting together: Representations and coordination processes.
10 In *Shared Representations: Sensorimotor Foundations of Social Life* (pp. 216–235).
11 Cambridge, Massachusetts: Cambridge University Press.
- 12 Welsh, T. N., Elliott, D., Anson, J. G., Dhillon, V., Weeks, D. J., Lyons, J. L., & Chua, R.
13 (2005). Does Joe influence Fred’s action? Inhibition of return across different nervous
14 systems. *Neuroscience Letters*, 385(2), 99–104.
15 <https://doi.org/10.1016/j.neulet.2005.05.013>
- 16 Welsh, T. N., & McDougall, L. M. (2012). Negative Priming in a Joint Selection Task. *PLOS*
17 *ONE*, 7(8), e42963. <https://doi.org/10.1371/journal.pone.0042963>
- 18 Woźniak, M., & Knoblich, G. (2019). Self-prioritization of fully unfamiliar stimuli. *Quarterly*
19 *Journal of Experimental Psychology*, 174702181983298.
20 <https://doi.org/10.1177/1747021819832981>

21